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10/813,060	03/31/2004	Alexander R. LaChance	9-14774-13US	4650

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EXAMINER
PARK, EDWARD

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>31 March 2004</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some *   c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date *3/31/04*.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U.S. (15 How.) at 112-14. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in Sec. 101.

> ... a signal does not fall within one of the four statutory classes of Sec. 101.

> ... signal claims are ineligible for patent protection because they do not fall within any of the four statutory classes of Sec. 101.

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

2.   **Claims 18 and 20** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 18 and 20 define a computer readable modulated carrier signal with descriptive material. While "functional descriptive material" may be claimed as a statutory product (i.e., a "manufacture") when embodied on a tangible computer readable medium, a computer readable modulated carrier signal embodying that same functional descriptive material is neither a process nor a product (i.e., a tangible "thing") and therefore does not fall within one of the four statutory classes of § 101. Rather, "signal" is a form of energy, in the absence of any physical structure or tangible material.

3.   **Claims 18 and 20** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 18 and 20 defines an article comprising a computer readable modulated carrier signal embodying functional descriptive material. However, the claim does not define a computer-readable medium or memory and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). That is, the scope of the presently claimed an article comprising a computer readable modulated carrier signal can range from paper on which the program is written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claim to embody the program on "computer-readable medium" or equivalent in order to make the claim statutory. Any amendment to the claim should be commensurate with its corresponding disclosure.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or
> described as set forth in section 102 of this title, if the differences between the subject
> matter sought to be patented and the prior art are such that the subject matter as a whole
> would have been obvious at the time the invention was made to a person having ordinary
> skill in the art to which said subject matter pertains. Patentability shall not be negatived
> by the manner in which the invention was made.

5.   **Claims 1, 11, 12, 13, 14, 15, 17, 18, 19, 20** are rejected under 35 U.S.C. 103(a) as being

unpatentable over Abt et al (US 2003/0084409 A1) in view of Jouandet (US 5,038,285).

Regarding **claims 1, 11, 12,** Abt teaches a method for producing a three-dimensional

model of a semiconductor chip from coarsely aligned mosaic images of respective layers of the

semiconductor chip (figure 1), the method comprising: applying a line detection algorithm to

each of the mosaic images (Abt: figure 1, numeral 12, 13); and processing to define vias, lines

and branch lines of the semiconductor chip, interconnected to define the three-dimensional

model (Abt: figure 1, numeral 17). Abt does not teach producing a set of line segments

identified by x and y coordinates of ends of each line segment with respect to a frame defined by

the mosaic image; establishing virtual reference marks using end points of different mosaic

images that are vertically aligned to within an uncertainty of the coarse alignment of the mosaic

images; using the virtual reference marks to adjust x and y coordinates of each of the mosaic

images to derive a three dimensional coordinate space; processing the end points within the three

dimensional coordinate space; counting a number of other mosaic images that have coincident

end points in a common projective x-y plane within an uncertainty of the coarse layer alignment;

identifying end points with a high coincidence in the x-y plane; selecting from the identified end

points the virtual reference marks; and identifying a mosaic image having end points associated

with a highest percentage of the virtual reference marks, and aligning each mosaic image to the

identified mosaic image by adjusting x and y coordinates of each of the other mosaic images.

Jouandet teaches producing a set of line segments identified by x and y coordinates of

ends of each line segment with respect to a frame defined by the mosaic image (Jouandet: figure

1, numeral 20); establishing virtual reference marks using end points of different mosaic images

that are vertically aligned to within an uncertainty of the coarse alignment of the mosaic images

(Jouandet: figure 1, numeral 22); using the virtual reference marks to adjust x and y coordinates

of each of the mosaic images to derive a three dimensional coordinate space (Jouandet: figure 2,

numeral 26); processing the end points within the three dimensional coordinate space (Jouandet:

figure 3); counting a number of other mosaic images that have coincident end points in a

common projective x-y plane within an uncertainty of the coarse layer alignment (Jouandet:

figure 2, numeral 32); identifying end points with a high coincidence in the x-y plane (Jouandet

figure 2, numeral 32); selecting from the identified end points the virtual reference marks

(Jouandet figure 2, numeral 32); and identifying a mosaic image having end points associated

with a highest percentage of the virtual reference marks (Jouandet figure 2, numeral 32), and

aligning each mosaic image to the identified mosaic image by adjusting x and y coordinates of

each of the other mosaic images (Jouandet: figure 3).

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Abt reference to identify line segments, establish virtual reference marks,

adjust coordinates, process the end points, identify end points with high coincidence, and align

each mosaic image as suggested by Jouandet, to "produc[e] two-dimensional maps of three-

dimensional surfaces" (Jouandet: col. 1, lines 8-9) that "reduc[es] distortion between straight

lines representations" (Jouandet: col. 3, lines 13-16).

Regarding **claim 13**, Abt teaches wherein processing the end points further comprises

using predefined rules regarding configuration of the line segments to define lines and branch

lines of the semiconductor chip (Abt: paragraph [0043]).

Regarding **claims 14, 15, 17**, Abt with Jouandet combination discloses all elements as

mentioned above in claim 1. Abt with Jouandet combination as mentioned above does not teach

displaying the 3-dimensional model to an operator, as a set of lines of predefined thickness.

Jouandet further teaches displaying the 3-dimesional model to an operator, as a set of

lines of predefined thickness (Jouandet: figure 4, numeral 76), permitting the user to view any

one of the mosaic images alone, the mosaic images with the 3-D model overlayed, and the 3-D

model alone (Jouandet: figure 4, numeral 76); and permitting the operator to select a geometric

area and displaying a part of the 3-D model in the geometric area (Jouandet: figure 4).

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Abt with Jouandet combination to display a 3-dimensional model to an

operator as suggested by Jouandet, to allow the user to visualize the object; allow the user to alter

any parameters; or observe any defects that may have not been detected and corrected.

Regarding **claim 18**, Abt teaches an article comprising a computer readable modulated

carrier signal and means embedded in the carrier signal for executing the method ("application

program"; Abt: paragraph [0059]) of any of claims 1-17.

Regarding **claim 19**, Abt teaches an article comprising a computer readable memory storing program instructions and means embedded in the memory for executing the method ("application program"; Abt: paragraph [0059]) of any of claims 1-17.

Regarding **claim 20**, Abt teaches an article comprising a computer readable modulated carrier signal for transmitting program instructions for executing the method ("application program"; Abt: paragraph [0059]) of any of claims 1-17.

6.   **Claims 2, 3, 4, 5, 6, 9, and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Abt et al (US 2003/0084409 A1) with Jouandet (US 5,038,285) as applied to claim 1 above with Companion et al (US 6,330,354 B1), and further in view of Maruyama (US 5,272,763).

Regarding **claims 2, 3, 4, 5, 6, 9, and 10** Abt with Jouandet combination discloses all elements as mentioned above in claim 1. Abt with Jouandet combination does not teach:

applying an edge detector to obtain an edge bitmap defining edge objects;

selecting pixel regions of edge objects that are likely to constitute segments of metal lines, given parameters of the semiconductor chip;

applying a line tracing algorithm to each edge object to identify and store coordinates of corresponding line segments;

storing line segment coordinates in a hierarchical format with branch line segments nested with respect to previously identified line segments;

applying an algorithm that computes a difference between pixel values of neighboring pixels on opposite sides of a subject pixel to determine that the subject pixel is an edge transition pixel if the difference is above a predefined threshold;

applying an algorithm derived from at least one of Sobel, Prewitt, Roberts, and Hough

transforms;

applying a line thinning procedure to pixels of the mosaic image bounded by the pixel

regions of selected edge objects to produce a thinned line;

defining the line segments by coordinate positions of the pixels at the ends of line

segments, and storing the end point coordinates in a database;

computing for each line segment a measure of uncertainty that the line segment

constitutes a part of a metal line, using properties of the edge object, and properties of the

thinned line give the die properties; and

requesting an operator to examine the line segments with uncertainty measures above a

predefined threshold.

Companion teaches:

applying an edge detector to obtain an edge bitmap defining edge objects (Companion:

figure 2b, numeral 120);

selecting pixel regions of edge objects that are likely to constitute segments of metal

lines, given parameters of the semiconductor chip (Companion: figure 2b, numeral 120);

applying an algorithm that computes a difference between pixel values of neighboring

pixels on opposite sides of a subject pixel to determine that the subject pixel is an edge transition

pixel if the difference is above a predefined threshold (Companion col. 5, lines 1-21);

applying an algorithm derived from at least one of Sobel, Prewitt, Roberts, and Hough

transforms (Companion: col. 5, lines 1-21); and

computing for each line segment a measure of uncertainty that the line segment

constitutes a part of a metal line, using properties of the edge object, and properties of the

thinned line give the die properties (Companion: figure 2b, numeral 124, 126).

requesting an operator to examine the line segments with uncertainty measures above a

predefined threshold (Companion: figure 2b, numeral 140).

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Abt with Jouandet combination to apply an edge detector, select pixel

regions, apply a Hough transform as suggested by Companion, to rule out "false positives [that]

would most likely occur [but are difficult] to handle [within many] layers, [of] repetitive pattern

sequences" (Companion: col. 1, lines 55-65).

Maruyama teaches:

applying a line tracing algorithm to each edge object to identify and store coordinates of

corresponding line segments (Maruyama: col. 9, lines 59-68; col. 10, lines 1-23);

storing line segment coordinates in a hierarchical format with branch line segments

nested with respect to previously identified line segments (Maruyama: col. 3, lines 1-28);

applying a line thinning procedure to pixels of the mosaic image bounded by the pixel

regions of selected edge objects to produce a thinned line (Maruyama: col. 9, lines 59-68; col.

10, lines 1-23); and

defining the line segments by coordinate positions of the pixels at the ends of line

segments, and storing the end point coordinates in a database (Maruyama: col. 9, lines 59-68;

col. 10, lines 1-23).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the Abt, Jouandet, with Companion combination as mentioned above to apply a line tracing algorithm, storing in a hierarchical format, line thinning procedure, and coordinate positions of the pixels as suggested by Maruyama, to "accurately perform the wiring pattern inspection without requiring complex positioning" which is essential due to the numerous lines that are present.

7.   **Claims 7, 8** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Abt et al (US 2003/0084409 A1), Jouandet (US 5,038,285), Companion et al (US 6,330,354 B1), with Maruyama (US 5,272,763) as applied to claim 6 above, and further in view of Martin et al (Robotics, "Image Processing Techniques for Machine Vision").

Regarding **claims 7 and 8**, Abt, Jouandet, Companion, with Maruyama combination discloses all elements as mentioned above in claim 6. Abt, Jouandet, Companion, with Maruyama combination does not teach iteratively setting pixel values of boundary pixels to a background pixel value, until the pixels that remain are bounded by background pixel values on two sides and applying an algorithm derived from at least one of a Zhang Suen skeletonizing algorithm, and a Stentiford skeletonizing algorithm.

Martin teaches iteratively setting pixel values of boundary pixels to a background pixel value, until the pixels that remain are bounded by background pixel values on two sides (Martin: pg. 6, right column) and applying an algorithm derived from at least one of a Zhang Suen skeletonizing algorithm, and a Stentiford skeletonizing algorithm (Martin: pg. 6-8).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the Abt, Jouandet, Companion, with Maruyama combination to utilize a

Stentiford skeletonizing algorithm as suggested by Martin, to "erode the outer layers of pixel until no more layers can be removed" which proves to be a "popular because of their reliability and effectiveness" (Martin: pg. 7, left column).

8.   **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Abt et al (US 2003/0084409 A1) with Jouandet (US 5,038,285) as applied to claim 14 above, and further in view of Phan et al (US 6,808,591 B1).

Regarding **claim 16**, Abt with Jouandet discloses all elements as mentioned above in claim 14. Abt with Jouandet combination does not teach permitting the operator to select any line, to create an annotation for a selected line; and to edit the connectivity of the line segments, and placements of vias.

Phan teaches permitting the operator to select any line, to create an annotation for a selected line; and to edit the connectivity of the line segments, and placements (Phan: col. 4, lines 15-35).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the Abt with Jouandet combination to allow the operator to select and edit line segments and placements as suggested by Phan, to further enhance the operator's ability to examine and rectify any defective line segments by graphical analysis.

Conclusion

9.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Park whose telephone number is (571) 270-1576. The examiner can normally be reached on M-F 10:30 - 20:00, (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Brian Werner can be reached on (571) 272-7401. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

<div style="text-align: right;">
Edward Park
Examiner
Art Unit 2624
</div>

/Edward Park/

/Brian P. Werner/
Supervisory Patent Examiner (SPE), Art Unit 2624